4. ILLUMINATION STANDARDS RECOMMENDATIONS

4.1 GENERAL STANDARDS FOR ILLUMINATION LEVELS

AASHTO guidelines have been adopted as a basis for DC streetlight illumination standards. The design values proposed in the current Ballot Draft version of AASHTO guide is used in this policy. Any subsequent future modifications in AASHTO standards will be reviewed by DDOT for inclusion in this policy.

Table 10 lists the recommended ranges for the average maintained illuminance levels for the various roadway classifications as defined by DDOT. The average maintained illuminance represents the output of the lamp and luminaire, after reduced by the maintenance factors (e.g., light loss depreciation and dirt depreciation); expressed in average foot-candles (lux) for the pavement area. The light loss depreciation is defined as the decline in the light lumen that occurs as a lamp is operated over time. Dirt accumulates on luminaires, decreases the total output of light and lowers the overall efficiency of the system. This process is called luminaire dirt depreciation. The table is derived for all types of road surface classification. Most of the roadway pavements in the District are either R2 or R3 class.

Table 10. Recommended Average Maintained Illuminance for District Roadways[7]

DC Street Classification	Land Use	Recommended Average Maintained Illuminance (foot-candle)		
		R1	R2 & R3	R4
Interstate	Residential	0.6 to 0.7	0.6 to 0.7	0.6 to 0.7
	Intermediate	0.7 to 0.9	0.7 to 0.9	0.7 to 0.9
	Commercial	0.7 to 1.1	0.7 to 1.1	0.7 to 1.1
Other freeways and Expressway	Residential	0.6	0.8	0.7
	Intermediate	0.7	1.1	0.9
	Commercial	0.9	1.3	1.2
Principal Arterials	Residential	0.6	0.8	0.7
	Intermediate	0.8	1.2	1.0
	Commercial	1.1	1.6	1.4
Minor Arterial	Residential	0.5	0.7	0.7
	Intermediate	0.7	1.0	0.9
	Commercial	0.9	1.4	1.0
Collector	Residential	0.4	0.6	0.5
	Intermediate	0.6	0.8	0.7
	Commercial	0.7	1.1	0.9
Local Street	Residential	0.3	0.4	0.4
	Intermediate	0.5	0.7	0.6
	Commercial	0.6	0.8	0.7
Alleys	Residential	0.2	0.3	0.3
	Intermediate	0.3	0.4	0.4
	Commercial	0.4	0.6	0.5

[7] Recommendations based on *Roadway Lighting Design Guide Ballot Draft*, AASHTO, 2004.

For illuminated sidewalk areas, the following average maintained illumination levels should be designed along all DDOT roadway classifications for either R2 or R3 class with the criteria based on the level of commercial development.

Table 11. Recommended Average Maintained Illuminance for Sidewalks[8]

DC Sidewalk Locations	Recommended Average Maintained Illuminance (foot-candle)		
	R1	R2 & R3	R4
Residential Areas	0.3	0.4	0.4
Intermediate Areas	0.6	0.8	0.7
Commercial Areas	0.9	1.3	1.2

4.2 OTHER STANDARDS AND DESIGN CRITERIA

4.2.1 Uniformity Ratios

For the DDOT roadway classifications shown below, the following uniformity ratios (average-to-minimum) should be used as a guideline in the design of the lighting system.

Table 12. Recommended Average-to-Minimum Uniformity Ratios

DC Street Classification	Average-to-Minimum Uniformity Ratio
Interstate	3:1 or 4:1
Other freeways and Expressway	3:1
Principal Arterials	3:1
Minor Arterial	4:1
Collector	4:1
Local Street	6:1
Alleys	6:1

4.2.2 Veiling Luminance Ratios

AASHTO is currently updating the design guide, which states that the veiling luminance ratio requirement should be used as a design guideline along with uniformity ratios in the design of the lighting system. The veiling luminance ratio will need to be satisfied in order to insure that the disability glare is minimized to reduce the blinding effect from light shining directly into the eyes of drivers and pedestrians. The veiling luminance ratios shown in Table 13 are from the current Ballot Draft version of AASHTO guide. DDOT will review any future modification in AASHTO standards for inclusion in this policy.

[8] Recommendations based on *Roadway Lighting Design Guide Ballot Draft*, AASHTO, 2004.

Table 13. Recommended Veiling Luminance Ratios[9]

DC Street Classification	Veiling Luminance Ratio
Interstate	0.3:1
Other freeways and Expressway	0.3:1
Principal Arterials	0.3:1
Minor Arterial	0.3:1
Collector	0.4:1
Local Street	0.4:1
Alleys	0.4:1

4.2.3 Vertical Light Distribution Patterns[10]

For residential areas, mixed-use and commercial areas, all luminaires must have a Full cutoff luminaire light distribution with zero candelas (intensity) at an angle of 90 degrees or above, or a Cutoff luminaire light distribution where the candela per 1,000 lumens does not exceed 25 (2.5%) at an angle of 90 degrees or above.

By establishing the standards for lighting fixtures in residential, intermediate, and commercial areas, rear obtrusive light can be minimized.

4.2.4 Lateral Light Distribution Patterns

The following lateral light distributions should be used for the DDOT roadway classifications:

Table 14. Recommended Light Distribution Patterns[11]

DC Street Classification	Lighting Distribution Pattern
Interstate Roadway	Type III or Type IV
Freeway/Expressway	Type III or Type IV
Principal Arterial	Type III or Type IV
Minor Arterial	Type III
Collector	Type III
Local Street	Type II or Type III
Alleys	Type II

If lighting poles are located in the medians of roadways or within islands that have traffic flows on both sides of island, a Type V lateral lighting distribution pattern may be used.

4.2.5 Minimum Light Pole Spacing

For all DDOT roadway classifications, a pole height and lighting fixture must be chosen to meet the average maintained illumination levels and uniformity ratios identified earlier, and to have pole spacings at 60 feet or greater. In cases where lighting designs require pole

[9] Recommendations based on: *Roadway Lighting Design Guide Ballot Draft*, AASHTO, 2004.
[10] Recommendations based on: *City and County of Denver Rules and Regulations for Outdoor Lighting*.
[11] Recommendations based on: *American National Standard Practice for Roadway Lighting*.

spacings to be less than 60 feet to reach the desired illumination levels and uniformity ratios, a different pole and/or lighting fixture must be considered first to meet or exceed a 60- foot minimum spacing requirement. For pole spacing less than 60 feet, exceptions must be approved by DDOT.

4.3 LIGHTING ILLUMINATION OF SPECIAL AREAS

For special areas of the City, as defined by DDOT, higher average maintained illumination levels than those identified earlier might be desirable to draw special attention to the area. These could include, but not be limited to, Gateways of the City, Monumental Core Areas, and BID Areas. If these locations have their own regulations regarding the level of illumination, designs should be based on those regulations. Furthermore, DDOT will make the determination whether an area should be designed with different lighting criteria than those identified above (BIDS, National Park Service, Monumental Core, etc., are exempted as of the publication of this report).